

INPUTS OF CHLORINATED HYDROCARBONS

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Discharges of DDT wastes from the Palos Verdes submarine outfalls have resulted in unusually high levels of this pesticide in our coastal waters. In addition, polychlorinated biphenyls (PCB) released from several large municipal systems have caused local enhancements of this industrial material near the points of discharge.

Because of the importance of these synthetic organics, we need to relate their input rates via municipal wastewaters to those from other possible sources. Thus, under a grant from the U.S. Environmental Protection Agency, we are now conducting a survey of chlorinated hydrocarbon inputs to our coastal waters from six possible routes. These are municipal wastewater, direct industrial discharge, surface runoff, antifouling paints, aerial fallout, and ocean currents.

We obtained estimates of the input rates for 1973 from these sources through several sampling and analysis programs. Replicate 7 day composites of municipal wastewater were collected during summer and fall of 1973 from the five largest treatment plants along the southern California coast. A variety of industrial effluents from chemical, metal processing, petroleum refining, fish canning, and power production facilities were obtained in fall 1973 from San Pedro Harbor, the area receiving the greatest variety of direct industrial discharges in southern California. We also collected depth integrated samples of stormwater and dry weather flow from throughout southern California between 1971 and 1973 to provide information on this input mode. Chlorinated hydrocarbons were extracted from these various wastewater samples according to usual chemical procedures and analyzed by electron capture gas chromatography.

To investigate marine inputs of these synthetic organics resulting from the use of vessel antifouling paints, we surveyed major harbors and marinas along southern California during 1973. Information on the types and quantities of paints used annually was obtained at shipyards, haul out facilities, and marine paint outlets. Samples of the major paints applied to naval, commercial, and recreational vessels along this coast were extracted and analyzed for PCB and DDT compounds.

During the summer of 1973 and the winter of 1974, we made replicate week long collections of aerial fallout on glass plates situated at approximately 20 coastal and island stations between Point Conception and northern Baja California. The samples were analyzed for chlorinated hydrocarbons according to a procedure developed by Dr. Vance McClure, National Marine Fisheries Service at Tiburon, California.

Finally, we made a special collection of offshore seawater from the surface layer between Point Conception and San Nicholas Island. Using a new seawater extraction technique, replicate samples from the seven stations were analyzed for DDT and PCB compounds by Brock de Lappe and Dr. Robert Risebrough, University of California at Berkeley.

Results from the analyses of these samples were combined with the appropriate flow, use, or flux data to obtain estimated annual mass emission rates for each input mode, which are summarized in Table 1.

This comparison shows that municipal wastewaters are still the major known source of DDT compounds and Dieldrin to southern California marine waters. Our data indicate that approximately 95 percent of the DDT and 65 percent of the Dieldrin input through wastewaters come from the JWPCP* effluent discharged on the Palos Verdes shelf. Regarding PCB, it appears that the input through aerial fallout into

the coastal zone (an area of approximately 500 by 100 km) is equivalent to that of the municipal wastewaters. However, while fallout of this material generally constitutes a diffuse input, approximately 95 percent of the known municipal wastewater inputs of PCB into this area result from submarine discharges within about 25 km of Palos Verdes Peninsula. Thus, this latter input essentially constitutes a "semipoint" source of PCB to the coastal zone between Point Conception and the U.S./Mexico border.

Our research to date has not revealed any evidence of significant releases of chlorinated hydrocarbons from direct industrial discharges to San Pedro Harbor. But studies are now in progress to examine such inputs in other areas of southern California. Present applications of antifouling paints to vessels along the coast do not contribute any significant quantities of these materials to the environment, and surface runoff generally contributes only about 10 percent of the total coastal inputs. In comparison, ocean currents flowing through the mixed layer of the southern California Bight are estimated to carry roughly the same amounts of DDT and PCB compounds as are released to these waters from the coastal sources investigated.

This study is now approximately 80 percent completed. Details will be provided during the coming year in a final report to the Environmental Protection Agency (Grant Number R801153) and in technical memoranda and scientific publications.

TABLES

Table 1.

Estimates of 1973 annual mass emission rates of chlorinated hydrocarbons (kg/yr)

	Total DDT	Dieldrin	PCB 1254
Municipal wastewater	3,300	280	1,500 _a
Industrial discharges to San Pedro Harbor	17	4	51
Surface runoff	~188	52	194
Antifouling paint	<1	<1	<1
Aerial fallout	805 _b	72 _c	1,590
Subtotal	4,300	410	3,300
Ocean currents	7,000	NA _d	4,000
Total	11,300		7,300

_a Recent developments in our analytical procedures indicate that, on the average, PCB 1242 concentrations in these wastewater are two to three times those of PCB 1254.

_b(p,p' + o,p') DDT, the principal compounds identified in aerial fallout.

_c Based on a median value of 0.09 for the ratio of Dieldrin to total DDT observed in aerial fallout samples.

_d Not applicable.